CTEH
THE SCIENCE OF READY℠

ITC Tank Fire

Deer Park, TX

Work Area

Air Sampling and Analysis Plan (SAP)

Version 1.1

Prepared on Behalf of:

Intercontinental Terminals Company

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Air Monitoring and Sampling Strategy

CTEH®, LLC is focusing on the mixtures, chemicals, and indicators of flammability chosen below because they are among the most important and readily monitored hazards of burning petroleum products and/or blends including: pyrolysis gasoline, naphtha, gasoline blend stock, toluene, xylene, and lube oil products. In theory, complete combustion of a hydrocarbon fuel would yield gaseous carbon dioxide (CO_2) and water; however, in situations where incomplete combustion occurs the composition of visible soot will contain both a particulate and gaseous component which may include the parent compounds (or mixtures) along with any combustion by-products formed. As such, this Sampling and Analysis Plan (SAP) outlines the analytes and methodologies to be utilized by CTEH® to monitor the air quality within the Work Area as defined herein. Due to the ever-changing nature of emergency events, monitoring and/or sampling for some of the chemicals described within this document may be conducted on a periodic basis or even discontinued as initial monitoring and/or sampling results indicate that these chemicals and indicators do not pose a concern to worker health. Combustion products will not be monitored in the absence of a fire.

The purpose of this SAP is to characterize the air quality within the several zones in which occupational exposure limits are relevant under this particular scenario. These zones are identified in **Attachment 1** and include the following: The Impacted Tank Farm, the Restricted Community, the Industrial Areas, and each of the individual Divisions as outlined. Many of these areas have limited public access. Air monitoring readings collected as part of this plan occur at breathing-zone height. Particularly within the many of these defined areas, CTEH® may be requested to record readings which are not representative of an individual's breathing zone (e.g., container head space, ground level, etc.). Under these circumstances, such readings will be recorded under the sub-category of Site Assessment. As Site Assessment readings are often conducted for operational purposes, no action levels for Site Assessment are utilized. Should resultant air monitoring efforts demonstrate the potential for exposure to benzene above applicable exposure guidelines, results are directly communicated to the interested party. A separate worker exposure monitoring plan will be prepared for the purposes of collecting personal air samples on applicable and representative work positions.

CTEH® may conduct both handheld real-time air monitoring in addition to utilizing radio-telemetering instruments. Real-time hand-held instruments may be recorded in a variety of areas based on levels of activity, proximity to the release, and site conditions. Such readings may be recorded based upon an assessment made by field personnel at locations representative of worker populations. If applicable, notes will be made as to the level of respiratory protection, if any, donned by the workers in the vicinity. Radio-telemetering monitoring may be performed using RAESystems AreaRAE Instruments posited at fixed locations within the facility. If utilized, these units will be monitored from a centralized location for the purpose of monitoring the site for situational awareness and changing site conditions. Efforts will be made to verify any sustained detections above specified action levels with a hand-held instrument.

CTEH Site-Specific Action Levels

CTEH site-specific action levels will be employed within the identified work areas to provide information for corrective action to limit potential exposures. These values do not replace worker exposure standards or guidelines but are intended to represent a concentration limit that triggers a course of action to better address worker health. Action level exceedances will be communicated to Site Management and the CTEH Project Technical Director by the CTEH Project Manager (PM). Exceedances of action levels will be used to guide allocation of monitoring personnel and determine potential sampling locations to collect additional data.

Work Area Air Monitoring

Objective: Report air levels before they reach those requiring respiratory protection

Analyte	Action Level	Action to be Taken	Basis	Instrument	Detection Limit	Notes	Correction Factor
VOCs	1 ppm 5 min.	Assess for the presence of benzene/toluene/hexane, Report reading to PM	To avoid over exposure to benzene/toluene/hexane	MultiRAE PID AreaRAE PID	0.1 ppm	Range: 1 – 5,000 ppm	NA
Benzene*	0.5 ppm 5 minutes	Exit Area or don air purifying respirator; report reading to PM	OSHA PEL Action level/ACGIH TLV-TWA	UltraRAE PID	0.025 ppm	UltraRAE - Change SEP tube frequently	NA
				Gastec tube #121L	0.05 ppm	Range: 0.1 – 65 ppm Volume: Variable	Var.
				Dräger X-pid 9000/9500	0.02 ppm	0.02 – 25 ppm	NA
Benzene*	5 ppm Sustained	Exit Area, move upwind; report reading to PM	Max Use Concentration for half-mask APR (APF = 10)	UltraRAE PID	0.025 ppm	UltraRAE - Change SEP tube frequently	NA
				Gastec tube #121L	0.05 ppm	Range: 0.1 – 65 ppm Volume: Variable	Var.
				Dräger X-pid 9000/9500	0.02 ppm	Range: 0.02 – 25 ppm	NA
Benzene*	25 ppm	Exit Area, move upwind; report reading to PM	Max Use Concentration for full-face APR (APF = 50)	UltraRAE PID	0.025 ppm	UltraRAE - Change SEP tube frequently	NA

Analyte	Action Level	Action to be Taken	Basis	Instrument	Detection Limit	Notes	Correction Factor
	Sustained			Gastec tube #121L	0.05 ppm	Range: 0.1 – 65 ppm Volume: Variable	Var.
				Dräger X-pid 9000/9500	0.02 ppm	Range: 0.02 – 25 ppm	NA
1,3-Butadiene	0.5 ppm - 5 min.	Exit Area or don air purifying respirator; report reading to PM	OSHA PEL Action level	Dräger X-pid 9000/9500	0.07 ppm	Range: 0.07 – 25 ppm	NA
1,3-Butadiene	5 ppm Sustained	Exit Area, move upwind; report reading to PM	Max Use Concentration for half-mask APR (APF = 10)	Dräger X-pid 9000/9500	0.07 ppm	Range: 0.07 – 25 ppm	NA
1,3-Butadiene	25 ppm Sustained	Exit Area, move upwind; report reading to PM	Max Use Concentration for full-face APR (APF = 50)	Dräger X-pid 9000/9500	0.07 ppm	Range: 0.07 – 25 ppm	NA
Hexane*	50 ppm	Sample only as requested, Report reading to PM	ACGIH TLV (n-hexane)	Gastec tube #102L	1 ppm	Range: 4 – 1,200 ppm Volume: Variable	Var.
Naphtha*	300 ppm	Sample only as requested, Report reading to PM	ACGIH TLV (Gasoline)	Gastec tube #106	0.1 ppm	Range: 0.5 – 28 ppm Volume: Variable	Var.
Ethyl Benzene*	20 ppm	Sample only as requested, Report reading to PM	ACGIH TLV (Ethyl Benzene)	Cross-Sensitive with Gastec Tubes No. 122L & No. 123L.			
Xylene*	100 ppm	Sample only as requested, Report reading to PM	ACGIH TLV (Xylene)	Gastec Tube #123L	1 ppm	Range: 2 – 200 ppm Volume: Variable	Var.
Toluene*	20 ppm	Sample only as requested, Report reading to PM	ACGIH TLV (Toluene)	Gastec tube #122L	0.5 ppm	Range: 1 – 100 ppm Volume: Variable	Var.
NO_2**	0.2 ppm	Sample if workers near smoke/combustion products; Exit Area, move upwind; report reading to PM	ACGIH TLV (NO_2)	MultiRAE Sensor	0.1 ppm	Range: 0 -20 ppm	N/A
				Gastec tube #9L	0.1 ppm	Range: 0.5 – 125 ppm Volume: Var.	Var.
SO_2**	0.2 ppm	Sample if workers near smoke/combustion products; Exit Area, move upwind; report reading to PM	TLV-STEL (SO2)	MultiRAE Sensor	0.1 ppm	Range: 0 – 20 ppm	NA
				Gastec tube #5Lb	0.05 ppm	Range: 0.05 – 10 ppm Volume: Variable	Var.

Analyte	Action Level	Action to be Taken	Basis	Instrument	Detection Limit	Notes	Correction Factor
Particulate Matter ($PM_{2.5}$ or PM_{10})**	351 $\mu g/m^3$ 5 min	Report reading to PM	Wildfire Smoke Guidelines for 1 hr. avg. upper-bound breakpoint for unhealthy AQI	SidePak AM510	0.001 mg/m^3	$PM_{2.5}$ impactor – 50% cut-off at 2.5 micron PM_{10} impactor – 50% cut-off at 10 micron	NA
PM2.5 or PM10**	200 $\mu g/m^3$ 8 hrs	Report reading to PM	See above - 8 hr. guideline	SidePak AM510	0.001 mg/m^3	See above	NA

* Note that each of these analytes are detectible on the MultiRAE PID with the following correction factors: Benzene (0.47), ethylbenzene (0.47), toluene (0.45), xylene (0.39), hexane (0.34). If workers are actively working around known product, the VOC action level may be modified for that specific chemical. **To be used if reignition of the fire occurs. Monitoring for combustion products may be discontinued when the fire is extinguished

Flammability								
Analyte	Action Level	Corrected Value	Action to be Taken	Basis	Instrument	Detection Limit	Notes	Correction Factor
LEL	1 %	--	Notify PM	Changing Site Conditions	MultiRAE Sensor AreaRAE Sensor	1 %	Measuring range: 1 – 100%	2.6
LEL	4.7 %	10%	Exit area and Notify PM	Basis – Benzene	MultiRAE Sensor AreaRAE Sensor	1 %	Measuring range: 1 – 100%	2.1
LEL	3.8 %	10 %	Exit area and Notify PM	Basis - Gasoline	MultiRAE Sensor AreaRAE Sensor	1 %	Measuring range: 1 – 100%	2.6
LEL	3.4 %	10 %	Exit area and Notify PM	Basis - Xylene	MultiRAE Sensor AreaRAE Sensor	1 %	Measuring range: 1 – 100%	2.9
LEL	4.1 %	10 %	Exit area and Notify PM	Basis - Toluene	MultiRAE Sensor AreaRAE Sensor	1 %	Measuring range: 1 – 100%	2.4
VOC	10 % LEL for Pygas as a volatile atmospheric composition is 2,200 ppm VOCs							

General Information on Procedures (Assessment Techniques) Used

Procedure	Description
Guardian Network	A Guardian network may be established with AreaRAEs equipped with electrochemical sensors at locations around the work zone perimeter. The AreaRAEs will be telemetering instantaneous data at 15-second intervals to a computer console. MultiRAE Pros may also be used in the network. The data will be visible in real-time at the computer console and will be monitored 24 hours per day by CTEH personnel.
Real-Time Handheld Survey	CTEH staff members may utilize handheld instruments (e.g. MultiRAE Plus; ppbRAE, Gastec colorimetric detector tubes, etc.) to measure airborne chemical concentrations. CTEH will use these handheld instruments primarily to monitor the ambient air quality at breathing zone level. Additionally, measurements may be made at grade level, as well as in elevated workspaces, as indicated by chemical properties or site conditions. CTEH may also use these techniques to verify detections observed by the AreaRAE network.
Analytical sampling	Analytical sampling may be used to validate the fixed and handheld real-time monitoring data, or to provide data beyond the scope of the real-time instruments. Analytical samples may be collected as whole air samples in evacuated canisters or on specific collection media, and sent to an off-site laboratory for further chemical analysis.

Quality Assurance/Quality Control Procedures

Method	Procedure
Real-Time	Real-time instruments may be calibrated in excess of the manufacturer's recommendations. At a minimum whenever indicated by site conditions or instrument readings. Co-located sampling for analytical analysis may be conducted, if necessary, to assess accuracy and precision in the field. Lot numbers and expiration dates may be recorded with use of Gastec colorimetric tubes.
Analytical	Chain of custody documents may be completed for each sample. Level IV data validation may be performed on the first sample group analyzed. Level II data validation may be performed on 20% of all samples. Level IV data validation may be performed on 10% of all samples.
Reporting	Daily data summaries may be provided for informational purposes using data that have not undergone complete QA/QC. Comprehensive reports of real-time and/or analytical data may be generated following QA/QC and may be delivered 60 days following receipt of validated results, if applicable.

Glossary

Term	Definition
Sustained	Instrument reading above the action level continuously for the listed time period.
Excursion Limit	Whenever a reading exceeds an ACGIH® TLV by 5 times (if the chemical does not have a STEL- or Ceiling-based action level), exit the area and notify the PM
Breathing zone	The area within an approximate 10-inch radius of an individual's nose and mouth.
Ambient Air	That portion of the atmosphere (indoor or outdoor) to which workers and the general public have access.

Attachment 1

CTEH

ITC Fire Location Categories

0 0.5 1 Miles

Project: 111356
Client: ITC
City: Pasadena, TX
County: Harris

Division C

Industrial Area

Division D

Division B

Restricted Community

Division A

Division E

Impacted Tank Farm

Industrial Area

Legend

COORDINATE SYSTEM: *NAD 1983 UTM Zone 15N* DATUM: *North American 1983*

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